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ABSTRACT

This paper presents a synthesis of the development of educational management practices, with the aim of improving communications among the various institutions providing vocational programs at the local level and the agencies providing programs support at local, state, and national levels. The planning and management cycle consists of: (1) policy planning, which is concerned with the identification, description, structuring, and evaluation of goals and objectives, (2) work planning, which is the process of determining how to accomplish a selected objective efficiently and effectively and is concerned with the immediate task of planning, organizing, scheduling, and controlling resources, (3) development of a management information system, which provides information for operations control and long range planning, and (4) development of a formalized procedure for organizing and reorganizing management information in ways that will improve policy planning, work planning, and program operating decisions. The process of planning and managing local programs will vary according to the perception of planning and program management. Awareness of the Federal laws and agencies providing support will help clarify the atmosphere in which the local planner must work. (SB)

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PLANNING TECHNIQUES FOR LOCAL PROGRAMS OF VOCATIONAL EDUCATION

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preface

Local vocational education directors and others should find this publication helpful. The author describes both work and policy planning, sets forth the basis for planning, and discusses management information systems as they apply to program planning and implementation.

Companion publications on these same topics include *Review and Synthesis of Research on Management Systems for Vocational and Technical Education* by James Hale and *Planning and Management Systems for State Programs of Vocational and Technical Education* by Daryush M. Nowrasteh, both cited in the bibliography.

The profession is indebted to Joseph Malinski for his scholarship in the preparation of this report. Recognition is also due Leo Sims, Vocational Education, Tallahassee, Florida; Joseph Mills, Pinellas County Schools, Florida; and Paul Braden, The Center, for their critical review of the manuscript prior to its final revision and publication. J. David McCracken, information specialist at The Center, coordinated the publication's development.

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PLANNING TECHNIQUES FOR LOCAL PROGRAMS OF VOCATIONAL EDUCATION

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Introduction

The multiplication of educational and other services provided by local educational agencies has resulted in the expansion of sponsoring agencies with which local administrators must deal in securing support for various programs, services and activities. During the early stages of development of each new program or service, the funding and administration of these activities was, and many times still is, kept separate from the normal ongoing activities of the local educational agency. This has been necessary in order to determine if the program was serving the target population or the specific educational problem to be addressed. Currently the emphasis on the performance objectives which result from a program or activity makes it necessary to develop the means to describe what terminal value has resulted from the expenditure of program resources or what level of resources input is required to achieve an objective. Also limitations are being placed on the availability of resources, making it necessary to develop procedures for ranking and evaluating program priorities in a systematic and understandable manner.

The author has had the opportunity to view the development of educational management practices from the national, state and local scene. The purpose of this paper is to present one synthesis of the present "state of the art," to the end that improved communications can be achieved among the various institutions providing vocational and technical programs at the local level and the agencies that are involved in program support at the local, state and national levels.

The material presented is divided into four sections for ease in presentation.

1) Context for Planning
2) Policy Planning
3) Work Planning
4) Management Information Systems

Each is viewed independently in order to describe its function. In some cases the verbal presentation of a function indicates a more formalized proeedure than actually exists in practice.

The bibliography lists references where the reader may get additional information on a specific area. In addition to the review of published matter, extensive use was made of notes taken at meetings and conferences. Many of these activities were outside of education. Therefore, if all of the persons' names who contributed to this paper were listed, the list would exceed the manuscript.

context for planning

The process and techniques of planning for and the management of local programs of vocational and technical education will vary according to the perception of planning and program management. A brief review of the federal laws directly concerned with vocational education and a listing of other agencies that provided support for local programs should clarify the atmosphere in which the local planner and program manager for vocational and technical education must work.

The objective of vocational education under the Smith-Hughes (U.S. Congress, 1916) and George-Barden (U.S. Congress, 1946) Acts was to provide skill development programs for specific occupations. Time, facility and teacher specifications were studied. Methods were developed to measure program performance in terms of the stated objective. The functional and organizational structure of vocational education was the same from the local to the national level. Separate administrative offices were formed to serve the various occupational areas with the objective of specific skill development leading directly to employment or improvement of occupational skill.

The passage of the Vocational Education Act of 1963 (U.S. Congress, 1965) provided a new benchmark for vocational educational planning. The emphasis of vocational program planning was changed from that of building programs based on the needs or competencies required in an occupation, which tended to emphasize pre-enrollment student selection based on potential for success, to identification of the resources needed to prepare an individual to perform satisfactorily in the occupation of his choice.

The interrelationships of vocational programs at all levels were recognized and the purposes of vocational education were changed from job-centered programs to a person orientation. The purposes of the Vocational Education Act of 1963 as they affected instructional planning were: programs for secondary students, post-secondary full-time students, and supplementary training for people presently employed whether to update their skills to maintain employability, or to upgrade their skills so that they might be eligible for advancement. Provisions were also made to provide for people with special educational needs.

Funds were provided for research in vocational education. The broadened purposes of the Act made possible the development of programs which did not conform to traditional organizational patterns in vocational education.

In the 1968 Amendments to the 1963 Act additional objectives have emerged. The implementation of the Vocational Education Amendments of 1968 (U.S. Congress, 1968) placed on local educators, including but not limited to vocational educators, the requirements for the preparation and execution of a plan which would:

1) Provide for broad public participation in planning for programs, services and activities in vocational and technical education.
2) Organize vocational and technical education into a unified planning, operating and reporting subsystem within the local educational system.

3) Provide for coordinated vocational education program opportunities for persons of all ages in the area.
4) Provide for vocational education needs of disadvantaged persons in regular programs or to design special programs or services for them.
5) Provide for the vocational education needs of handicapped persons in regular programs or to design special programs or services for them.
6) Provide preservice and in-service education for vocational educators to update or retrain those professionals needed to achieve the broadened objectives.
7) Develop a systematic method for identifying, designing, testing and installing more efficient and effective programs of occupational information and orientation, occupational exploration, skill development, updating, upgrading and retraining to meet the need interests and abilities of people in light of existing and developing opportunities for employment.

In enacting the Amendments, Public Law 90-576 (U.S. Congress, 1968) established a national policy requiring the development of a planning and management system for vocational and technical education that would react more quickly to the dynamics of the economy and society and thereby provide more efficient and effective programs which would:

1) Provide for manpower needs and job opportunities now and for changes that will occur in the future.
2) Take into consideration the educational and economic needs and aspirations of the people to be served.

Alternative or supplementary sources of local program support are often available from agencies other than the state board for vocational education. Some of these programs (U.S. Executive Office of the President, 1971) are:

DEPARTMENT OF COMMERCE
- Economic Development-Grants and Loans for Public Works and Development Facilities
- National Technical Information Service

DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
- Vocational Rehabilitation Services for Social Security Disability Beneficiaries
- Work Incentive Program-Child Care
- Rehabilitation Services Projects-New Career Opportunities

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
- Housing for Educational Institutions

DEPARTMENT OF THE INTERIOR
- Indian-Adult Education

DEPARTMENT OF LABOR
- Concentrated Employment Program
- Manpower Development and Training-Institutional Training
- Manpower Experimental and Demonstration Projects

Neighborhood Youth Corps

A narrow view would consider and treat these additional resources as competitive to vocational education. However, the utilization of resources for purposes not authorized under current regulations may provide the evidence necessary to cause the modification or elimination of constraints to achievement of objectives.

A long term goal would be to have all institutions and agencies providing vocational and technical or occupational education programs responsive to a single output based management information and analysis system. The development of a uniform long-range planning model will be necessary to adequately fulfill the goals stated above.

Also necessary will be the development of uniform measures to determine the resources available to local programs of vocational and technical education and the cost of these programs. Finally, procedures need to be developed which will measure the resource utilization and local management skills used to achieve the goals and objectives identified and planned for in the local long-range and annual plan.

Thus the focus has been shifted from the processes of vocational education to the products. All processes currently in use are available to all program areas and levels for planning purposes. Some examples of educational processes follow.

1) Simulation shops and laboratories
2) The cooperative method
3) The project method

One responsibility of the local planner and manager is to study and test different methods of achieving objectives and then communicate the results to others. Therefore, as uniform local planning and management formats are developed, local vocational educators will have the opportunity to analyze the performance of various program processes and choose those which will most effectively achieve the objective identified.

It is in this context that this paper is being written. What is the environment in which vocational and technical education exist?

1) What needs to be done?
2) How much is being done now?
3) How much do present programs cost?
4) What must be done to improve and further develop programs of vocational and technical education?

The art and science of systematic program management based on the students' needs, interests, abilities and post-treatment performance of those students is just developing.

policy planning

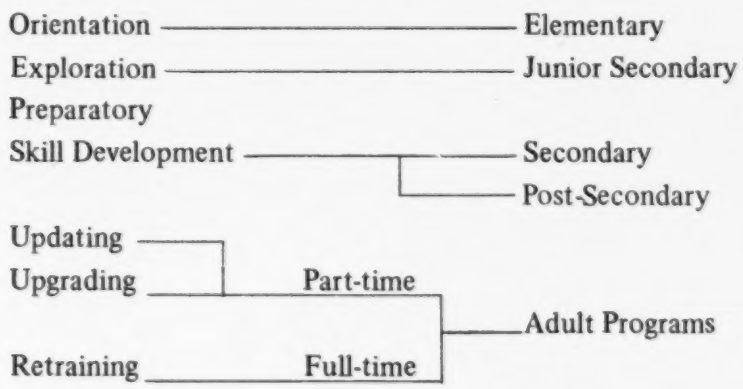
Policy planning is concerned with the identification, description, structuring and evaluation of goals and objectives. The question is, what should be done, not how to do it. The what is oriented to the ultimate solution of

identified problems. Or in other words, policy planning is in the political dimension. Bertram M. Gross' definition describes this type of planning.

> Planning is an exercise in conflict management rather than only the sober application of technical rationality. Any real life planning process may be characterized as a stream of successive compromises punctuated by frequent occasions of deadlock or avoidance and occasional victories, defeats and integrations. (Hartley, 1968)

Policy planning is the process of providing the rationale for decisions which require the allocation of resources between competing objectives. The complexity of the activity, while obvious in its process, has challenged description because no systematic means was available to structure the process or to measure the results of policy planning. With the requirement of a local long-range plan for vocational education, the means to measure the results of policy planning became available.

The development of a long-range plan requires the identification and definition of the goals and objectives of vocational and technical education. In order to be effective it must identify related, as well as complementary objectives. The following program structure could be used to describe the objectives of occupational education, while at the same time indicating an appropriate level for program planning.



This structure stated as objectives follows. The objectives of vocational education programs are:

1) To Provide Entry Job Proficiency Training: Those programs which are designed to provide the skills and knowledge necessary for job entry at the completion of high school.
2) To Prepare Students for Advanced or Post-Secondary Training: Those programs which are designed to allow a high school student to begin a program in secondary school which will be completed in a post-secondary institution.
3) To Provide Occupational Exploration: Programs which focus attention on a group or cluster of business or industrial occupations related to the student's interest. Generally, these programs are designed to provide the student with an experience which contains one performance cycle of the occupations.

4) To Provide Occupational Orientation: These programs make the student aware of the wide range of occupations available and inform him of the knowledge and skills which are required for the successful entry into such occupations.

5) To Provide Occupational Updating: Programs which focus attention on a sequence of skills or related knowledge that will maintain skills required to continue in the present occupation.

6) To Provide Occupational Upgrading: Programs which focus attention on a sequence of skills and knowledge that will provide additional skills for advancement.

7) To Provide Occupational Retraining: Programs which focus attention on a sequence of skills and knowledge that will provide new skills required for a change in occupations.

Programs designed to meet the need for career orientation and exploration will compete with academic skill development programs for space, dollars, staff, and student time. It is also necessary to further clarify information about preparatory skill development as both secondary and post-secondary programs are shown as impacting against the objective. Some additonal questions that are a part of policy planning are: What occupations require no formal training? Can the preparation be completed in high school? Is there sufficient employment and student demand to offer the program?

The author feels that census-based projections eliminate the chance of duplicate counting. Also when the reverse sort is made to produce an occupation by industry matrix, valuable information is available for curriculum development.

The economic and technological changes that affect the need for updating, upgrading and retraining of adults in the labor force have resulted in the development of many programs which treat the results of those changes. A challenge remains to develop a systematic way of anticipating such changes. These changes often affect only a local communtiy or area rather than a state or the nation.

Another part of a local long-range plan for vocational and technical education is the identification of the program needs of potential students. The program structure can be the same as the one used to describe the objective of meeting labor market needs. However, we must add to each of the student levels the added characteristics of disadvantaged and handicapped. Diagrammatically we might view the structure as follows:

OBJECTIVE	EDUCATIONAL LEVEL	SPECIAL CONDITION
Orientation	Elementary	Handicapped
	Junior Secondary	Disadvantaged
	Secondary	
	Post-Secondary	
	Adult	

The objective to provide for orientation is used to illustrate that there can be program needs at all age levels.

Following the development of the program structure is the development of goals and objectives. The next step is the selection of appropriate performance indicators. These indicators should measure the degree to which objectives have been achieved. However, to be truly successful, uniform standards of measure will need to be established and used. Following are a few examples which might be used.

OBJECTIVE	PERFORMANCE INDICATOR
Orientation	Degree to which occupational aspiration match student abilities
Exploration	Degree to which occupational choices match available positions
Preparatory Skill Development	Percent of program graduates employed in the occupation

Next, the long-range plan should identify the total program costs over a period of years, thereby providing the means of relating planned performance against future costs of the program. If an objective is to reduce the number of post-secondary program dropouts or transfers, all of the resources applied to achieve this objective must be displayed.

To meet the objective stated above, these costs would include the direct costs of teacher salaries, equipment, instructional supplies and space used to house the program but also related costs such as the increased costs caused by reduction in class size of other programs. Additionally, if multiple funding with a number of agencies was involved, the contribution of each should be included. Alternative ways to achieve basic program objectives efficiently and effectively should be explored. This for managers of local programs of vocational and technical education is the most critical part of future policy planning. Skill development leading directly to employment has been the basic objective of vocational education programs since 1917. The Vocational Education Act of 1963 and Amendments of 1968 provided for additional objectives. These need to be included in the local long-range plan.

The local long-range or policy plan for vocational and technical education should not be viewed as a necessary evil in order to qualify for outside funds for program support but rather it should be a carefully constructed communications device to show all who see it:

1) The basic objectives of the vocational and technical education program;
2) The need to meet these objectives locally;
3) The current level of production of vocational and technical education and other related programs, both public and private in the community;
4) The cost of the current program; (If possible a per unit as well as a total cost should be developed, and if available comparable costs of all programs should be shown.)

5) The remaining work to be done. A projection of the cost of achieving basic objectives by several alternative means should be shown, whether or not these are a regular part of the approved vocational and technical education system.

work planning

Policy planning is the process of determining what to do. Work planning is the process of determining how to accomplish a selected objective efficiently and effectively. It is concerned with the immediate task of planning, organizing, scheduling and controlling resources. This planning is most often done in connection with the preparation of the annual budget. The work plan will show:

1) The work to be done or the objective to be accomplished;
2) A description of the resources to be used or required;
3) One or a set of alternative methods which might be used; and,
4) Provision for evaluating performance after the plan has been placed in operation.

Like budgeting, work planning may be either centralized or organized so that there is involvement at many levels within the organization. If one of the goals of developing a plan is to create a climate for change then maximum involvement in the development of the local annual plan for vocational and technical education would also be required.

The increasing use of computers in educational planning and management has made it possible to handle the volume of data which decentralized planning and budgeting requires. The Midwestern States Educational Information Project organized information about local education in five subsystems (Iowa, 1970); pupils, property, personnel, programs and finance. The finance subsystem, Program Oriented Budgeting and Accounting System (POBAS), has been developed and is available to local school districts (User Manual . . . 1971). In Minnesota one source of this service is Total Information for Educational Systems (TIES), sponsored by the Minnesota School Districts Data Processing Joint Board (1966). The implementation of this finance subsystem provides program cost information to the department level, thereby providing some information about property, personnel and programs. Implementation of the pupil subsystem within this or other integrated information systems will improve the development, operation and evaluation of educational programs with student based objectives. A student based planning model is shown below.

STUDENT CHARACTERISTIC	PROGRAM RESOURCES	LEVEL OF PERFORMANCE
1. Who is he? 2. What are his abilities? 3. What are his objectives? 4. What are his life support needs?	1. Personnel a. Characteristics b. Quantity 2. Property 3. Program content & organization 4. Finances applied 5. Student activities during program	The degree to which student objectives have been accomplished by measuring performance in the post program environment.

Alternative program designs will need to be developed to serve various population groups. Programs for handicapped or disadvantaged students require the planning for additional educational resources, and also planning for the substantial life support needs of these students.

Planning programs for students with different employment objectives can provide opportuntiy for varying length or intensity of programs for students with the following objectives:

1) Those with intermediate career goals to secure part-time or short term employment skills.
2) Those with a professional employment objective who wish related vocational preparation.
3) Those who wish to begin post-secondary programs while still in high school.

Establishing measures of performance is part of the planning process and the measurement should be appropriate for the objective. For example, comparison of the placement rate and earnings of regular students in a post-secondary program with the same measures of student performance from a program for disadvantaged, without classification could lead to false conclusions. Also if the effects of programs are interrelated, evaluation systems will need to be developed to show both the individual and accumulative benefits gained. Numerous techniques are available to assist the work planner; all of them provide for the improvement of plans for organizing, directing, and controlling resources and measuring progress.

Government has led the way toward the implementation of management science application, but educational systems are discovering its benefits both by reducing time and expense. Of particular note to administrators are systems analysis and network analysis.

Systems Analysis

A system is an organized or methodically arranged set of ideas, theories, or speculations, or it can be the established procedures themselves. To observe a system and make decisions about it, one can employ systems analysis. Systems analysis applies to long-range, strategic problems as well as tactical problems.

A systems analyst would be concerned with the identification, evaluation and modification of information flow and with the integration of information flow into information systems.

> Systems analysis often proceeds through the following typical stages: (1) a preparation of a series of flow charts, with ever-increasing detail; (2) a textual description of the existing system, using one of the flow charts as an outline; (3) the construction of a series of algebraic models, with an increasing number of variables and parameters; (4) the tentative identification of some of the strengths and weaknesses in the existing system; (5) the collection of data which will enable the analyst to test these hypothetical identification and any contemplated changes; (6) the validation of a growing body of specific-system principles; (7) the synthesis of a better system; and (8) a study of the difficulties in the transition from the present to the contemplated system. (Hough, 1970)

This listing is not complete until the newly devised system is installed. Here the administrator and researchers must combine their efforts.

Network Planning

Network planning is the overall term used to describe planning procedures such as Program Evaluation and Review Technique (PERT) and Critical Path Method (CPM). These formal procedures assist and improve administrative decision-making when a unique, large-scale project must be planned and controlled. They are used to show the relationship among the activities which need to be performed in order to achieve an objective. They can be used with either simple or complex production objectives such as guilding construction, curriculum design, equipment purchase scheduling, or they may be used to integrate all of the above plus staff selection and student recruitment for a new campus.

PERT begins by listing each subtask or event in the project--including seemingly small and insignificant ones. Each must be assigned a time requirement. The subtasks' places in time are then displayed in a network diagram. CPM also incorporates a graphic network of events. The two differ only in their refinement and details (Hough, 1970).

Both policy planning and network planning precede the decision of what, how, or how much to do. These planning activities require the search for an acceptance of new or different methods.

A workable plan predetermines how much work is to be done within a program, a department or an institution in vocational and technical education. It should serve the means to communicate the objectives to be achieved within the scope of the available resources. The qualifications of the persons who will be directing such planning procedures must include a thorough understanding of the work to be done.

Plan Implementation

Plan implementation is the process of transforming a plan into action. The utilization of resources is the most visable aspect of the local vocational and technical education program. Problems relating to buildings, purchases and delivery of supplies and equipment, payment of salaries, transportation of students and the multitude of other activities required for a smooth running organization consume much of the time of local administrators. Also, they have been schooled in process management. The recent development of introducing management by objectives and management for program outcomes has resulted in the establishment of process objectives such as improving the efficiency of the purchasing department, reducing the student absentee rate, or the production of curricular materials. All are essential activities. The achievement of vocational and technical education objectives derived from policy and work planning can only occur through the operating program process.

An additional consideration is that Part I, Administrative Provisions, of the Minnesota State Plan for Vocational-Technical Education reinforced by operating directives governs the process of local program operation, for those programs administered through the State Board for Vocational Education (Minnesota State Department of Education, 1969a). This document is similar to

previous state plans required under the provisions of the Smith-Hughes and George-Barden Acts. Part II, Long-Range Plan Provisions, and Part III, Annual Plan Provisions, provide for policy and work planning (Minnesota State Department of Education, 1969b, 1969c). As resources are applied to the development of these sections and local vocational educators become proficient in policy and work planning, modifications and improvement in efficiency of program processes can be justified in terms of achieving program objectives and implemented in an orderly manner.

management information systems

The essential characteristic of a management information system is the establishment of a data base which can be used for both operational control and long-range planning. It provides information which assists in setting program, service or activity objectives and helps determine the extent which current objectives have been achieved.

The local vocational and technical manager must be concerned with the information required for policy planning, work planning and program operations. He is in a strategic position as it is at the local level that the effects of policy and operational decisions influence student and program performance. Therefore the quality of locally based or generated information is critical.

Current requirements for long-range or policy planning in vocational and technical education call for the use of information about both the characteristics of the labor market and the characteristic objectives of the population to be served. Standardized information is needed which can measure the distribution of employment opportunities by skill, number, and growth rate. Other characteristics of such information which would be valuable would be that it would check against the total employment of an area, and that it be produced by an independent agency. One source of such information which could be made available nationally is a method used in a study to project occupational employment requirements to 1975 for Minnesota, the Minneapolis-St. Paul Metropolitan Area, and the state's 11 economic regions. It employs, as a basis, an industry-occupational matrix (Minnesota Department of Manpower Services, 1970).

> . . . The matrix provides coefficients, by type of labor required, to produce a unit of output by the industry in question. The technique makes use of national occupational requirements by industry to develop area projections, with the underlying assumption being that occupational employment within industries in the area will follow the same general pattern of change as is evidenced nationally. Obviously implicit, and perhaps a more important assumption, is that area occupational percentages within each industry will not tend to approach or diverge from national occupational percentages. Using only the nationally determined rate of occupational change for deriving the final projection allows the relative growth rate of the area industries to play the primary role in estimating future occupational requirements while at the same time bringing the national trends in occupational distribution by industry into the model.

Shown in Appendix A is a flow chart and description for producing the occupational employment distribution and projections cited above. The report format showing major classifications for the State of Minnesota follows:

MINNESOTA OCCUPATIONAL EMPLOYMENT

	Employment Number			Percent Change	
Classification	*1960*	*1968*	*1975*	*1960-1968*	*1968-1970*
Professional and Technical					
Managers, Officials, Proprietors					
Clerical					
Sales Workers					
Craftsmen					
Operatives					
Service Workers					
Farm Laborers					
Laborers					

The state and metropolitan section of the report gave information on 160 occupations. Regional projections were also made using the same procedure as shown for Region 1, the Northwest Rural Area (Appendix B) and Region 11, the Minneapolis-St. Paul Metropolitan Area (Appendix C). Additional useful information for determining instructional program content can be made available by producing reports of occupational employment by industry group.

The identification projection and reporting of information about the characteristics and objectives of a local population is a dimension that has only recently become a major concern of vocational and technical educators. No attempt will be made to review the many efforts underway to identify, classify and validate the usefulness of population related information for vocational and technical education planning.

The need for systematic educational information resulted in a major national effort to provide uniform definitions and guides for recording and reporting data. This was done through the development and publication of the State Educational Records and Reports Series (U.S. Office of Education). The title and purpose of each follows:

HANDBOOK I — The Common Core of State Educational Information (1958)

"This handbook is designed to serve the same purpose for certain basic items of educational information as the dictionary serves for words . . ."

HANDBOOK II	Financial Accounting for Local and State School Systems (1964) "Standard financial accounts will improve the accuracy of local, state and national summaries, and facilitate comparisons of financial information among communities and states. They will enable local and state educational authorities to obtain more suitable needed information for policy determination, improve accuracy of educational research, and facilitate and improve reliable reporting to the public on the condition and progress of education."
HANDBOOK III	Property Accounting for Local and State School Systems (1966) The handbook is the basic guide to property accounting and as such fulfills the same purposes as Handbook II.
HANDBOOK IV	Staff Accounting for Local and State School Systems (1965) The criteria used in the selection of items included in this handbook were similar to those used in Handbook V.
HANDBOOK V	Pupil Accounting for Local and State School Systems (1965) "Three basic criteria were used as guides in the selection of each item included in this handbook. According to these criteria each item produces information that (1) is important to and needed by local school systems, (2) is needed for the exchange of information about pupils who transfer or for comparisons of information about pupils, and (3) can be maintained as a record with reasonable effort. . ."
HANDBOOK VI	Standard Terminology for Curriculum and Instruction in Local and State School Systems (1970) "The consistent use of the terminology in this handbook can help improve the quality of education by facilitating meaningful evaluation, realistic planning and efficient operation of educational systems throughout the United States." A companion to Handbook VI is Vocational Education and Occupations (U.S. Office of Education, 1969) which relates subject matter areas to the Dictionary of Occupational Titles classification of occupations.

Although Handbook VII (U.S. Office of Education, 1971) is concerned with information about state education agencies, it is of value to all educators as it addresses the functions of general management, planning, research, development, and evaluation, consultive services, distribution of resources, internal services, and operation and approval of programs and schools. Implementation of this handbook will focus attention on the policy planning

activities of state education agencies and the effect of those policies on the efficiency and effectiveness of local program operations.

The availability of uniform input and process information through the use of the handbook series is an important first step in the development of a more functional management information system for vocational and technical education as well as other educational programs. Also needed are uniform definitions and classifications with which to measure program and student performance. The integration of both types of information into a single system could provide the basis for a more objective evaluation at all levels. Thus the total information system would contain all of the items of information which are necessary for each responsible person to analyze performance and produce required reports.

recommendations

The final step necessary to complete the planning and management cycle is the development of a formalized procedure for organizing and reorganizing management information in ways that will improve policy planning, work planning and program operating decisions. Rosove indicated the urgency of this need as follows:

> In the language of the information sciences, (--cybernetics, computer science, data processing, systems analysis, information storage and retrieval, etc.) education currently occurs in a non-real time mode but it may increasingly have both a need and a capability for operating in real time...--changes in society, in the economy, and in science and technology--imply a reduction in the amount of time for institutional adaptation. Education, from the point of view of its timeliness, can operate effectively in isolation from other institutions when change is relatively slow; it cannot be equally effective in isolation when change is relatively rapid, as is now the case. Hence we are led inexorably to the idea that within the next twenty years learning environments ought to be designed more like real-time information processing systems. (Rosove, 1969)

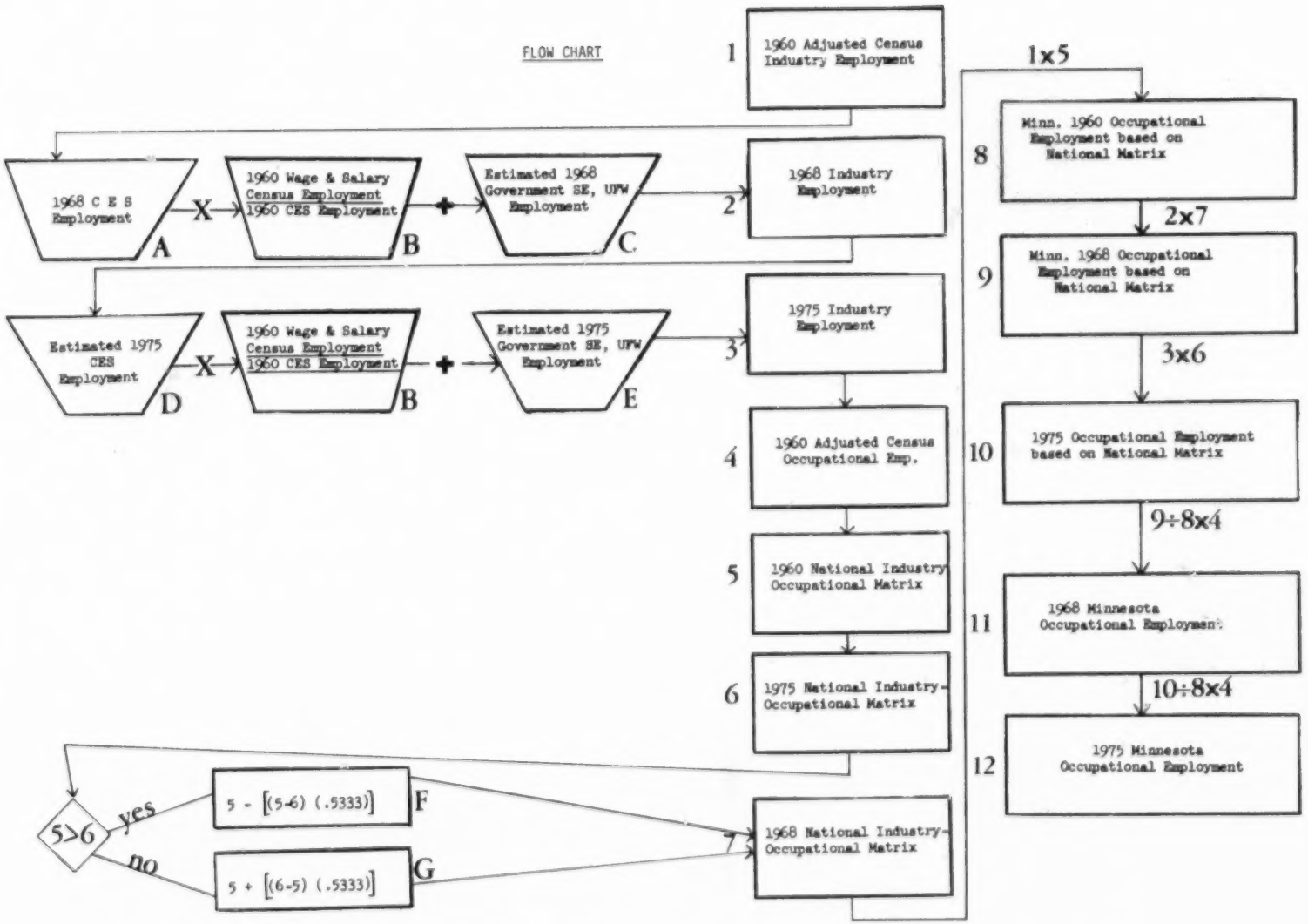
As stated earlier, recent actions by Congress in enacting much legislation concerned with providing employment and job skills to people has spotlighted the strengths and weaknesses of vocational and technical education. As people demand increased programming in vocational and technical education, these same demands also contained the charge to provide these programs efficiently and effectively.

More recently the recognition of the process of career education and the work of designing these programs has become a major activity of both vocational and technical and of general educators. The concept of interrelated objectives for education also requires interrelated analysis to measure program effectiveness. Therefore a most pressing need is the development of a uniform management analysis system which will provide a procedure which will identify, classify, assemble and report information of student characteristics upon entering programs, monitor their progress through programs related to resources

utilized and measure student performance at the next program level or as a follow-up after completing or leaving a program. The management analysis system should have the capability of also showing school district or institutional performance as well as the performance of individual programs.

Section 3.27 of the *Minnesota State Plan for Vocational and Technical Education, Part I,* (Minnesota State Department of Education, 1969a) contains the allocation formula of federal vocational and technical education funds to local agencies. This formula can function as the focal point of the management analysis system for vocational education. At the local level it can describe the efficiency and effectiveness of the utilization of resources, at the state level it can describe the appropriateness and effectiveness of the distribution of resources and at the national level it can describe the extent to which federal support is made available to achieve identified goals and objectives.

FLOW CHART



Source: Minnesota Department of Manpower Services (1970)

Industry Employment 1960, 1968, and 1975: State and Metropolitan Areas

The 1960 industry employment data was available from the 1960 Minnesota Census. Employment in the "industry-not-reported" category was prorated over the coded industries on the basis of their relative levels of employment to arrive at an adjusted figure (Flow Chart, Step 1).[1]

Estimates of wage and salary employment for 1968 were supplied by the Current Employment Statistics (C.E.S.) Program (Step A). In order to convert these figures into comparable census data, each estimate was mutliplied by its 1960 census wage and salary/1960 C.E.S. employment ratio (Step B). Projections of employment of government workers engaged in activities other than public administration (excluding those in education and medical services) were made by applying the 1960-1968 trend for C.E.S. covered government workers (excluding those in education and medical services) to the 1970 census count of government workers. Estimates for government workers in education and medical services were made separately using C.E.S. trends in these components. In a similar fashion, estimates of all other agriculture employment (domestic, self-employed, and unpaid family workers) were made using national and local information. The rate of change between the respective years was applied to the category within each industry. Adding these two categories together supplied the estimated government workers, self-employed (S.E.), and unpaid family workers (U.F.W.) employment (Step C). The revised wage and salary employment (Steps AxB) plus the above two categories (C) were summed for each industry resulting in the 1968 industry estimates to make them comparable to the 1960 census data (Step 2), the basis on which the national industry occupational matrix was developed.

Industry estimates of wage and salary employment from a previous study (Minnesota and Minneapolis-St. Paul Metropolitan Area Employment - 1975) were reviewed and revised when necessary (Step D). Metropolitan Area and "outstate" (remainder of the State) estimates were made separately. As in the 1968 estimates, this data was converted to comparable census data (Step B). Estimates for government, self-employed and unpaid family workers were arrived at in the same manner as the 1968 estimates using appropriate trend values (Step E). Again all categories of workers were summed (Steps DxB+E) resulting in 1975 industry estimates (Step 3).

Industry Employment 1960, 1968, and 1975: Economic Regions

The 1960 industry employment data was available from the 1960 census for each county. Employment in the "industry-not-reported" category was prorated over the coded industries on the basis of their relative levels of employment, as was done for the State and Metropolitan Area, to obtain the adjusted figure. Economic Region totals were arrived at by merely summing the appropriate county data.

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1 All numbered and lettered steps to which referrals are made in the narrative appear in the Flow Chart.

Covered employment data by industry for March 1960 and March 1968 were available for each county. Regional totals were again derived by summing the appropriate data. The rate of change in covered employment between these two time periods was applied to the adjusted 1960 Census employment. Since the "outstate" estimates for 1968 and 1975 formed the "control" totals for Economic Region Estimates, the 1968 industry employment by region was wedged to this total.

"First" estimates of employment for 1975 in all industries except government and agriculture were made using 1960-1968 trends. These estimates were then adjusted using covered employment data for March 1969, information on construction plans, and a judgmental interpretation of all available data. These adjusted estimates were then forced to conform to given "outstate" estimates. Trends between the 1959 and 1964 Census of Agriculture were used to estimate 1968 and 1975 agricultural employment. Because of the lack of any county data since 1964, the agricultural figures should be viewed with more skepticism than other industry estimates. Employment trends in all industries, with the exception of government, were then used to estimate government employment.

Occupational Employment 1960

The 1960 occupational employment, for the State and Metropolitan Area was obtained from the 1960 Minnesota Census. Regional occupational employment was available for each county from unpublished 1960 census data. Employment for the occupation-not-reported category was prorated in a manner similar to that for 1960 industry employment (Step 4). Also, several conversions were made for Bureau of Labor Statistics (BLS) occupations not directly comparable to census occupations. For example, the BLS classification of Other Medical Health Workers corresponds to chiropractors, student nurses, and therapists and healers, in the census. The above two operations provided the distribution of 1960 occupation employment that forms the base period estimate for deriving the 1968 and 1975 occupational projections.

National Matrix 1960, 1968, and 1975

The Bureau of Labor Statistics, U.S. Department of Labor, developed national industry staffing patterns for 1960 and 1975 (Steps 5 and 6). It was necessary to develop 1968 patterns in order to derive expected area growth in employment, by occupation, between a recent period (1968) and 1975. It would be of little value merely to report 1960 and 1975 figures for occupations with no way of showing how much change had already taken place. In order to develop the 1968 staffing patterns (Step 7), a linear interpolation (.5333 or 8/15) between the 1960 and 1975 patterns was used (Steps F and G). No better method of establishing a 1968 staffing pattern was available at the time, and while granting that this straight-line method has its flaws, the results should generally be valid. The actual manipulation of matrix data is relatively simple. Area employment in each local industry (51 industry groups for the State and Metropolitan Area and 11 for the regions) is multiplied by the specific occupational staffing coefficients (160 occupations for the State and Metropolitan Area and 40 for the regions) for each of the three periods and then

summed, by occupation, to get total occupational requirements. The result is an estimate of area occupational employment as it would be if the industries were staffed identical to the national pattern for 1960 (Step 8), 1968 (Step 9) and 1975 (Step 10).

Actual Employment Compared to Matrix Results

In actuality, the area's 1960 census occupational employment may not be the same as that based on national staffing patterns for 1960. Thus, only the rate of change in occupational distribution is used from the matrix results. The area's 1968 occupational employment (Step 11) is a product of the rate of growth in industry employment and change in occupational distribution from the 1960 matrix result (Step 8) to the 1968 total (Step 9) applied to the 1960 census occupational employment. 1975 area employment (Step 12) is derived in a similar manner utilizing the rate of growth and change from 1960 to 1975 and applying it to census employment (Minnesota Department of Manpower Services, 1970).

appendix b

Region I: Northwest Rural Area Occupational Employment

	Employment			Percent Change	
	1960	1968	1975	1960-1968	1968-1975
TOTAL	32499	33582	34012	3.3	1.3
Professional, Technical, Kindred	2636	3566	4070	35.3	14.1
Engineers, Technical	85	146	212	71.8	45.2
Natural Scientists	12	19	26	58.3	36.8
Medical, Other Health Workers	566	735	794	29.9	8.0
Teachers (Elem. and Sec.)	960	1214	1258	26.5	3.6
Social Scientists	--	---	---	--	--
Other Prof., Tech., & Kind.	1013	1452	1780	43.3	22.6
Accountants & Auditors	58	77	90	32.8	16.9
Architects	5	6	7	20.0	16.7
Designers & Draftsmen	18	29	39	61.1	34.5
Lawyers & Judges	53	66	69	24.5	4.5
Personnel & Labor Related Wkrs.	4	7	9	75.0	28.6
Other	875	1267	1566	44.8	23.6
Managers, Officials, Proprietors	2680	2849	2919	6.3	3.7
Clerical & Kindred	2289	2847	3271	24.4	14.9
Stenos, Typists, Secretaries	370	507	609	37.0	20.1
Office Machine Operators	16	23	29	43.8	26.1
Other Clerical & Kindred	1903	2317	2633	21.8	13.6
Bookkeepers	463	500	517	8.0	3.4
Cashiers	94	125	149	33.0	19.2
Shipping, Receiving Clerks	22	27	29	22.7	7.4

Telephone Operators	106	112	124	5.7	10.7
Other	1218	1553	1814	27.5	16.8
Sales Workers	1685	1793	1852	6.4	3.3
Craftsmen	2850	3339	3741	17.2	12.0
Carpenters	602	581	539	-3.5	-7.2
Electricians	91	105	114	15.4	8.6
Plumbers & Pipefitters	75	83	89	10.7	7.2
Foremen nec.	283	400	520	41.3	30.0
Machinists & Related	33	58	83	75.8	43.1
Blacksmith, Forge., Hammer.	21	25	25	19.0	--
Boilermakers	4	3	5	-25.0	66.7
Millwrights	—	--	--	--	--
Sheet Metal Workers	16	22	29	19.0	31.8
Toolmakers & Diemakers	--	--	--	--	--
Printing Trades Crafts	68	54	96	-20.6	88.2
Mechanics & Repairmen	832	1062	1244	27.6	17.1
Other Craftsmen	825	916	997	11.0	8.8
Operatives	2881	3578	4224	24.2	18.1
Assemblers	29	87	148	200.0	70.1
Welders	70	125	185	78.6	48.0
Sewers & Stitchers, Mfg.	--	--	--	--	--
Drivers & Deliverymen	1025	1147	1278	11.9	11.4
Other Operatives	1757	2219	2613	26.3	17.8
Service Workers	3754	4522	4728	20.5	4.6
Private Household	1031	1152	1043	11.7	-9.4
Protective Service Wkrs.	98	134	169	36.7	26.1
Waiters, Cooks, Bartenders, Countermen	1146 --	1279 --	1337 --	11.6 --	4.5 --
Other Service Workers	1479	1957	2179	32.3	11.3
Farm Laborers	12721	10024	8141	-21.2	-18.8
Laborers exc. Farm	1003	1064	1066	6.1	0.2

(Source: Minnesota Department of Manpower Services, 1970)

appendix c

Region XI: Minneapolis – St. Paul
Metropolitan Area Occupational Employment

	Employment			Percent Change	
	1960	1968	1975	1960-1968	1968-1975
TOTAL	591061	775369	906307	31.2	16.9
Professional, Technical, Kindred	84834	129522	163617	52.7	26.3
Engineers, Technical	10325	17975	23678	74.1	31.7
Natural Scientists	1757	2906	3761	65.4	29.4

Medical, Other Health Workers	16144	22162	27868	37.3	25.7
Teachers (Elem. & Sec.)	12756	17881	19428	40.2	8.7
Social Scientists	820	1236	1574	50.7	27.3
Other Prof., Tech., & Kind.	43032	67362	87308	56.5	29.6
Accountants & Auditors	7774	10919	13375	40.5	22.5
Architects	499	685	817	37.3	19.3
Designers & Draftsmen	3623	6028	7594	66.4	26.0
Lawyers & Judges	2473	3170	3591	28.2	13.3
Personnel & Labor Related Wkrs.	1306	2032	2620	55.6	28.9
Other	27357	44528	59311	62.8	33.2
Managers, Officials, Proprietors	54014	66293	74272	22.7	12.0
Clerical & Kindred	119750	158843	189625	32.6	19.4
Stenos, Typists, Secretaries	29243	40990	50491	40.2	23.2
Office Machine Operators	5554	8426	11189	51.7	32.8
Other Clerical & Kindred	84953	109427	127945	28.8	16.9
Bookkeepers	10387	12647	14360	21.8	13.5
Cashiers	5186	8101	10796	56.2	33.3
Shipping, Receiving Clerks	3537	4291	4571	21.3	6.5
Telephone Operators	3399	4140	4709	21.8	13.7
Other	62444	80248	93509	28.5	16.5
Sales Workers	53456	66090	74789	23.6	13.2
Craftsmen	82935	108727	124806	31.2	14.8
Carpenters	6724	6997	7050	4.1	0.8
Electricians	2749	3402	3788	23.8	11.3
Plumbers & Pipefitters	2983	3702	4293	24.1	16.0
Foremen nec.	10860	15402	18889	41.8	22.6
Machinists & Related	6564	9531	10048	45.2	5.4
Blacksmith, Forge, Hammer.	205	240	216	17.1	-10.0
Boilermakers	133	154	158	15.8	2.6
Millwrights	448	652	779	45.5	19.5
Sheet Metal Workers	1716	2353	2684	37.1	14.1
Toolmakers & Diemakers	1832	3107	3675	69.6	18.3
Printing Trades Crafts	4598	5309	5657	15.5	6.6
Mechanics & Repairmen	19870	28656	34841	49.3	21.6
Other Craftsmen	24253	29222	32728	20.5	16.0
Operatives	93614	123353	141631	31.8	14.8
Assemblers	9472	15883	18615	67.7	17.2
Welders	3056	5271	6781	72.5	28.6
Sewers & Stitchers, Mfg.	1830	1450	1597	-20.8	10.1
Drivers & Deliverymen	19485	23615	27148	21.2	15.0
Other Operatives	59771	77134	87490	29.0	13.4
Service Workers	66911	89115	106738	33.2	19.8
Private Household	10860	10701	9927	-1.5	-7.2
Protective Service Wkrs.	4595	5311	6402	15.6	20.5

Waiters, Cooks, Bartenders, Countermen	18773	26934	32775	43.5	21.7
Other Service Workers	32683	46169	57634	41.3	24.8
Farm Laborers	11044	7413	5207	-32.9	-29.8
Laborers exc. Farm	24503	26013	25622	6.2	-1.5

(Source: Minnesota Department of Manpower Services, 1970)

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MISSION OF THE CENTER

The Center for Vocational and Technical Education, an independent unit on The Ohio State University campus, operates under a grant from the National Center for Educational Research and Development, U.S. Office of Education. It serves a catalytic role in establishing consortia to focus on relevant problems in vocational and technical education. The Center is comprehensive in its commitment and responsibility, multidisciplinary in its approach and interinstitutional in its program.

The Center's mission is to strengthen the capacity of state educational systems to provide effective occupational education programs consistent with individual needs and manpower requirements by:

- Conducting research and development to fill voids in existing knowledge and to develop methods for applying knowledge.
- Programmatic focus on state leadership development, vocational teacher education, curriculum, vocational choice and adjustment.
- Stimulating and strengthening the capacity of other agencies and institutions to create durable solutions to significant problems.
- Providing a national information storage, retrieval and dissemination system for vocational and technical education through the affiliated ERIC Clearinghouse.